PINE RIVER POND

2016 SAMPLING HIGHLIGHTS

Station – 1 Deep

Wakefield, NH

Station 1 Deep (Figure 7) was used as a reference point to represent the overall Pine River Pond water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that were collected in the cold bottom water layer.

Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = No Data

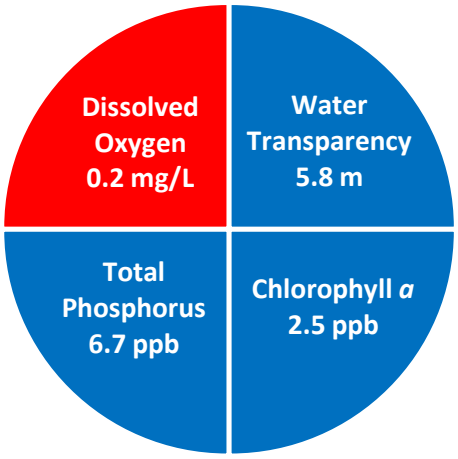


Figure 1. Pine River Pond Water Quality (2016)

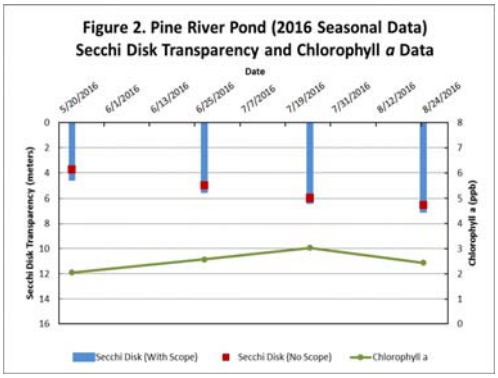
Table 1. 2016 Pine River Pond Seasonal Averages and NH DES Trophic Level Classification Criteria

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Pine River Pond Average (range)	Pine River Pond Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	**5.8** meters (4.5 – 7.0)	Oligotrophic
Chlorophyll *a* (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**2.5** ppb (2.0 – 3.0)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**6.7** ppb (5.8 – 7.7)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	**0.2** mg/L (0.1 – 0.6) *	Eutrophic

* Dissolved oxygen concentrations were measured between 11.5 and 16.5 meters, in the bottom layer, on August 24, 2016.

Table 2. 2016 Pine River Pond Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Pine River Pond Average (range)	Pine River Pond Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**13.2** color units (8.0 – 18.1)	Slightly colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	**6.9** mg/L (6.2 – 7.5)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**7.1** standard units (range: 6.9 – 7.2)	Optimal range for fish growth and reproduction
Specific Conductivity (*u*S/cm)	< 50 *u*S/cm Characteristic of minimally impacted NH lakes		50-100 *u*S/cm Lakes with some human influence	> 100 *u*S/cm Characteristic of lakes experiencing human disturbances		**53.0** *u*S/cm (range: 50.3 – 54.5)	Lakes with some human influence



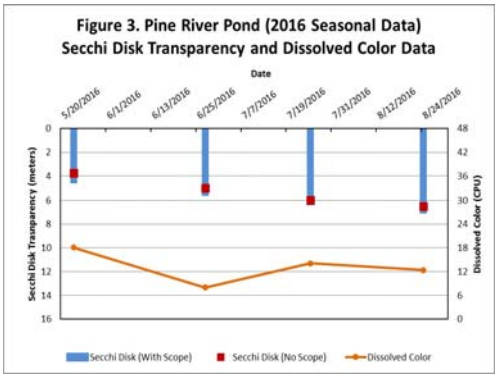


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations. Secchi Disk transparency data are reported for measurements collected with and without a viewing scope.

LONG-TERM TRENDS

WATER CLARITY: The Pine River Pond water clarity data, measured as Secchi Disk transparency, display a trend of decreasing water clarity from 1987 to 2016 (Figure 4). The long-term water clarity trend is based on the Secchi Disk transparency measurements that have been collected without a view scope.

CHLOROPHYLL: The Pine River Pond chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, have oscillated among years while the long-term trend from 1987 to 2016 is stable (Figure 4).

TOTAL PHOSPHORUS: The Pine River Pond total phosphorus concentrations, the nutrient most responsible for microscopic plant growth, display a trend of decreasing nutrient concentrations from 1987 to 2016 (Figure 5).

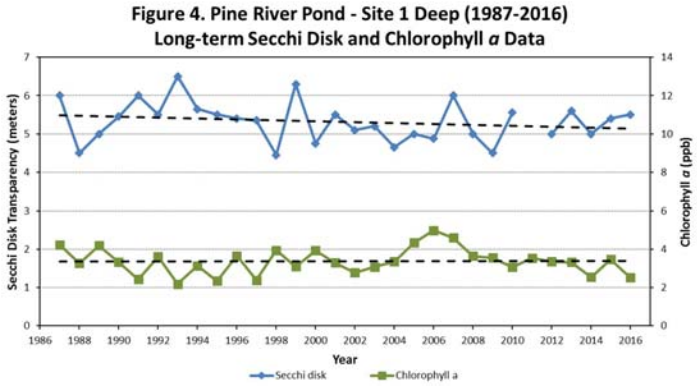


Figure 4. Pine River Pond - Site 1 Deep (1987-2016)
Long-term Secchi Disk and Chlorophyll *a* Data

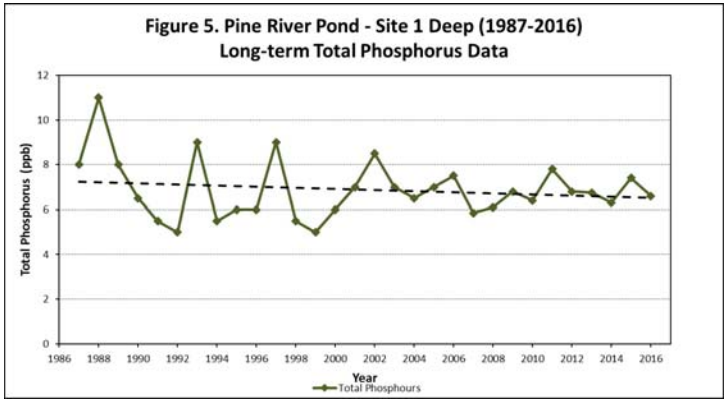


Figure 5. Pine River Pond - Site 1 Deep (1987-2016)
Long-term Total Phosphorus Data

Table 3. Pine River Pond Stream Inlet Seasonal Average Water Quality Inter-Site Comparison (2016)

Stream Inlet	Average (range) Total Phosphorus (ppb)	Average (range) Specific Conductivity (*u*S/cm)	Average (range) Alkalinity (mg/L)	Average (range) pH (standard units)
Quimby Brook	**5.1** ppb (single value)	**115.8** *u*S/cm (single value)	**9.3** mg/L (single value)	**6.8** units (single value)
Meadow Brook	**16.8** ppb (10.7 – 27.9)	**71.2** *u*S/cm (61.5 – 78.4)	**9.3** mg/L (5.9 – 11.7)	**6.9** units (6.9 – 7.0)
Young Brook	**12.6** ppb (10.5 – 15.2)	**112.4** *u*S/cm (78.8 – 132.5)	**9.9** mg/L (8.3 – 11.0)	**6.9** units (6.8 – 6.9)

Figures 4 and 5. Changes in the Pine River Pond water clarity (Secchi Disk transparency), chlorophyll *a* and total phosphorus concentrations measured between 1987 and 2016. **These data illustrate the relationship between plant growth and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

Figure 6. Monthly Pine River Pond dissolved oxygen profiles collected between June 27 and August 24, 2016. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish such as trout and salmon. *Notice the decreasing dissolved oxygen concentrations near the lakebottom between June 27 and August 24.*

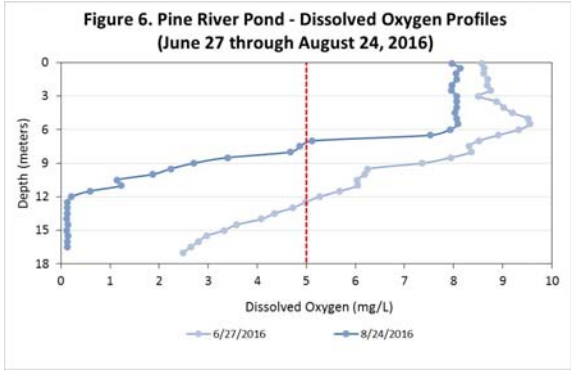


Figure 6. Pine River Pond - Dissolved Oxygen Profiles (June 27 through August 24, 2016)

Reccomendations

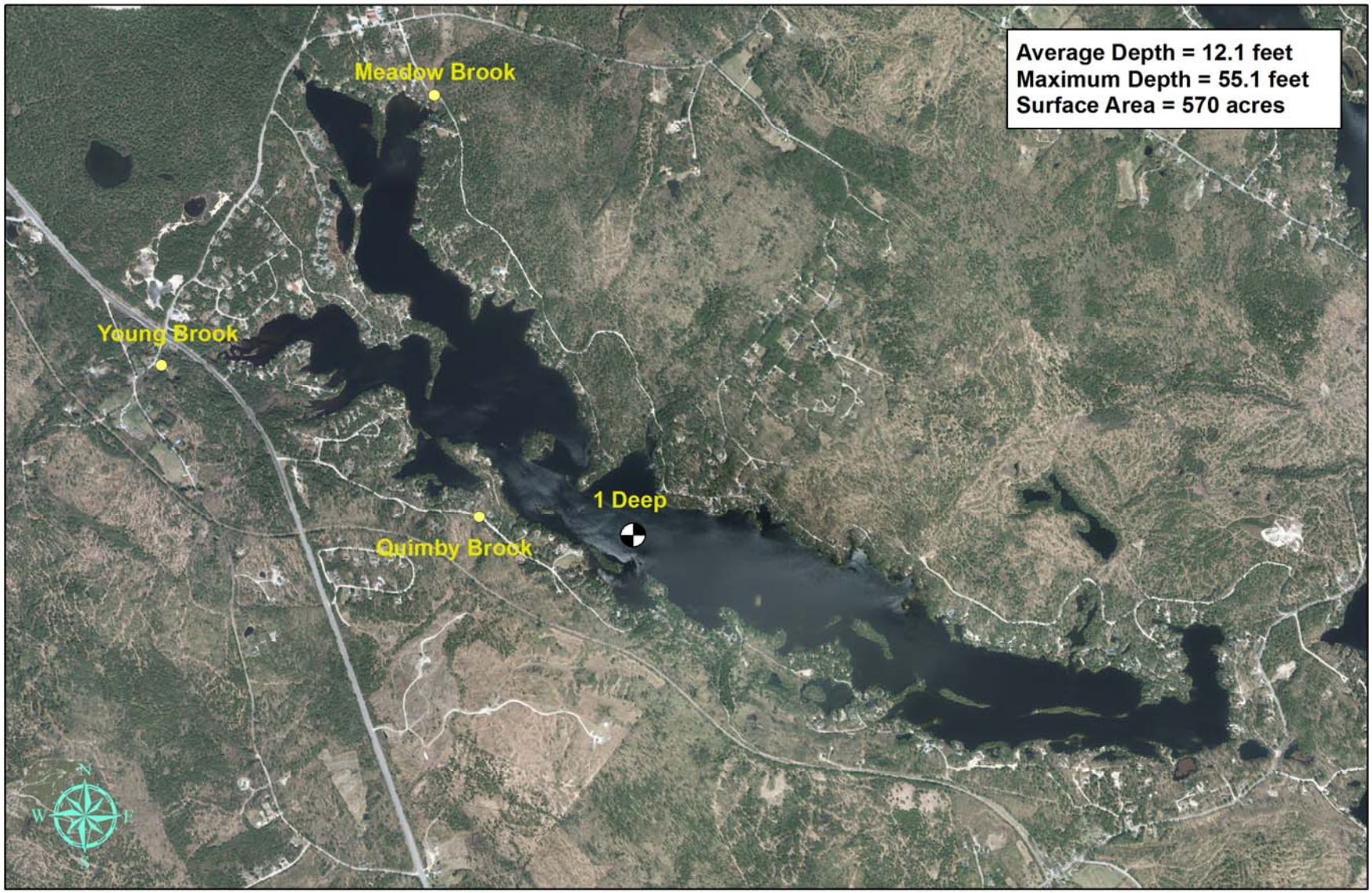
Implement Best Management Practices within the Pine River Pond watershed to minimize the adverse impacts of polluted runoff and erosion to the lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off. The Acton Wakefield Watershed Alliance also offers technical assistance to help design and implement erosion control projects that protect and improve the water quality.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf
- http://awwatersheds.org/healthy-lakes/conservation-practices-for-homeowners/

Figure 7. Pine River Pond

Wakefield, NH

2016 deep water and tributary sampling stations



Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center for Freshwater Biology

NH Extension

NEW HAMPSHIRE LAKES LAY MONITORING